

What is claimed is:

1. A post etch process for removing residues and polymers formed during an etching process from a semiconductor substrate, the process comprising:

exposing the substrate having the residues and the polymers thereon to plasma having a neutral chemistry for a period of time effective to substantially remove all of the polymers and residues from the substrate.
2. The post etch process according to claim 1, wherein the semiconductor substrate comprises at least one low k dielectric layer.
3. The post etch process according to claim 1 further comprising exposing the substrate to plasma having an oxidizing chemistry for a period of time effective to substantially remove all of a photoresist layer.
4. The post etch process according to claim 3, wherein exposing the substrate to plasma having the oxidizing chemistry is prior to exposing the substrate to the plasma having the neutral chemistry.
5. The post etch process according to claim 3, wherein exposing the substrate to plasma having the oxidizing chemistry is subsequent to exposing the substrate to the plasma having the neutral chemistry.

6. The post etch process according to claim 1 further comprising exposing the substrate to plasma having a reducing chemistry for a period of time effective to substantially remove all of a photoresist layer.
7. The post etch process according to claim 6, wherein exposing the substrate to plasma having the reducing chemistry is prior to exposing the substrate to the plasma having the neutral chemistry.
8. The post etch process according to claim 6, wherein exposing the substrate to plasma having the reducing chemistry is subsequent to exposing the substrate to the plasma having the neutral chemistry.
9. The post etch process according to claim 1, wherein the neutral chemistry comprises about equal amounts of atomic hydrogen species and atomic oxygen species.
10. The post etch process according to claim 9, wherein the neutral chemistry further comprises atomic fluorine species.
11. The post etch process according to claim 9, wherein the atomic hydrogen species are generated from a forming gas comprising a hydrogen gas and an inert gas.

12. A process for removing polymers and etch residues formed during etch from a wafer having a surface therein comprising a low k dielectric material, the process comprising:

heating the wafer;

5 flowing a gas mixture comprising an oxygen gas and a hydrogen bearing compound;

generating a plasma from the mixture to form atomic oxygen species and atomic hydrogen species;

10 exposing the wafer surface to the atomic species, wherein an amount of the atomic oxygen species is about equal to an amount of the atomic hydrogen species; and

reacting the atomic species with the polymers and residues to substantially remove the polymers and residues from the surface.

13. The process according to claim 12, wherein the wafer is heated to a temperature ranging from about room temperature to about 450°C.

14. The process according to claim 12, further comprising maintaining a pressure of less than about 6 torr.

15. The process according to claim 12, wherein the gas mixture further comprises a fluorine bearing gas.

16. The process according to claim 12, wherein the gas mixture further comprises water vapor.
17. The process according to claim 12, wherein the hydrogen bearing compound is selected from the group consisting essentially of a hydrogen gas, a water vapor, a hydrocarbon, a hydrofluorocarbon, a hydrogen gas mixture and mixtures thereof.
18. The process according to claim 17, wherein the hydrogen gas mixture comprises a forming gas comprising hydrogen gas and an inert gas, wherein the hydrogen gas is in an amount ranging from about 1 percent to about 5 percent by volume of the forming gas.

19. A microelectronic device prepared by the process of claim 1.
20. A microelectronic device prepared by the process of claim 12.

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